(12) **EUROPEAN PATENT APPLICATION**

(71) Applicant: DE LA RUE GIORI.S.A.
4, rue de la Palx
CH-1003 Lausanne (CH)

(72) Inventor: Eisenbarth, Christoph
P.O Box 581
El Granada CA 94018 (US)
Inventor: Mc Ghie, Dennis
150 Mimosa Way
Portola Valley CA 94028 (US)
Inventor: Jung, Harry
52 Coronada Avenue
San Carlos, California 94070 (US)
Inventor: Finkelstein Ira
985 Taji CT
San José, California 95122 (US)
Inventor: Panofsky, Edward
Star Route 159B
Woodside, California 94062 (SA)

(74) Representative: Jörchel, Dietrich R.A. et al
c/o BUGNION S.A.
10, route de Florissant
Case postale 375
CH-1211 Genève 12 Champel (CH)

(54) **Apparatus and method for checking printed matter.**

(57) Sheets with images are scanned to determine if the images are acceptable. Sheets with unacceptable images are marked with a reject mark. The images may define banknotes, securities, traveler checks, stamps, and so on.

EP 0 612 042 A2

a. Field of invention

This invention pertains to an apparatus for checking printed matter, and more particularly for checking continuous or discrete sheets with multiple images, such as banknotes, stamps, securities and so on.

b. Description of the Prior Art

Certain printed matter or documents such as banknotes, stamps, securities, travelers checks and so forth require complicated printing procedures to prevent unauthorized duplication, copying or counterfeiting. Inherently, this material must be printed accurately, since mistakes are taken as an indication that the material is not genuine. Of course complicated printing processes increase the chances of producing printed matter which has mistakes. Thus after completion, these documents must be checked carefully, and the documents with mistakes must be rejected. To the knowledge of the applicants, to date this checking is performed manually, on a one to one basis. The applicants are unaware of any automated systems capable of checking printed matter on line and of rejecting the unaccepted documents.

In view of the above-mentioned problems, it is an objective of the present invention to provide an apparatus for automatically checking and rejecting printed matter.

A further objective is to provide a apparatus which can perform document checking continuously on line without the need for human intervention.

Yet a further objective is to provide a flexible system which can perform its function at high speed.

Other objectives and advantages of the invention shall become apparent from the following description. A printed matter checking apparatus in accordance with this invention includes a scanning station for scanning printed matter and generating data corresponding to the scanned images, microprocessor means for analyzing data to determine if these images meet some preselected criteria and a reject station controlled by the microprocessor for rejecting printed matter which does not meet said criteria. The printed matter to be checked consists of images which are printed normally in two dimensional arrays on sheets. These sheets are sequentially fed to the subject apparatus, where they are scanned and if necessary to a reject station for rejection. Preferably, the reject station is adapted to receive specific identifying data from the microprocessor which identifies a specific document on the sheet to be rejected. The identified document is rejected for example by printing thereon a specific

word or a message.

Figure 1 shows a somewhat schematic diagram of a printed matter checking apparatus constructed in accordance with this invention;

Figure 2 shows a somewhat schematic cross-sectional view of the reject station of the apparatus of Figure 2; and

Figure 3 shows a plan view of a sheet with a plurality of documents printed thereon.

Referring now to the drawings, a plurality of images are printed on a sheet 10 by a printing press. For the sake of simplicity the printing press is illustrated by a pair of rollers 12, 14. These images 16, are normally identical, and are arranged in rows and columns defining a two dimensional array. Figure 3 shows a plan view of the sheet, it being understood that a different set of images having the same size are printed on the bottom surface 24 of sheet 10 in perfect registration with the images 16 to thereby define a plurality of documents, each document bearing one image on top and another on the bottom.

The printed matter checking apparatus may disposed in line with the rollers 12, 14. Alternatively, a stack of sheets 10 may be collected after printing and checked for accuracy at a later time.

In the embodiment of Figure 1, after printing, sheet 10 is forwarded to the printed matter checking apparatus including a scanner station with a set of scanners 18, 20. Scanner 18 scans the top surface 22 of sheet 10 and generates first digital data signals on line 26 representatives of the images 16 on this surface. Scanner 20 scans the bottom surface 24 of sheet 10 and generates a second set of data signals on line 28 representatives of the images on surface 24. Alternatively, sheet 10 may be reversed and run a second time across the scanner 18 to generate the second digital data signals.

The digital data on the two lines 26 and 28 are fed to a controller 30. This controller includes a microprocessor which performs high-speed digital analysis on the signals form these lines, and using certain preselected criteria determines if all the images on sheet 10 are acceptable. If these images acceptable, sheet 10 is forwarded without any further manipulation through a reject device 32.

If any one of the images does not meet the preset criteria, the sheet 10 is forwarded for further manipulation by reject station 30.

As shown in more detail in Figure 2, reject station 32 includes a plurality of individual marking devices 34. Preferably, these marking devices are aligned in a direction perpendicular to the movement of sheet 10. The number of marking devices 34 is equal to the number of rows of images 16 on sheet 10. Each mark device may consist of an impact printer, an ink jet printer or any other device

suitable for making a preselected reject mark on single image to identify it as a being rejected. The reject mark may be any mark easily visible and clearly identifiable. For example, the reject mark could be a big blob, an oversized X, a bar, the word VOID, and so on.

The controller 30 also includes several other devices which control the movement of the sheets 10 consecutively to and through the scanning station and to and through the reject station. It should be understood that the controller 30 may include a single microprocessor device, or several microprocessor devices, each device being dedicated for a particular function, i.e. checking banknotes, moving the sheets 10, and so on.

The controller 30 checks the images on sheet 10 on an individual basis. If a sheet has an image, such as 16' determined by the microprocessor to be unacceptable, the controller 30 provides information to the reject station which identifies the actual image to be rejected. For example if 16' in Figure 3 is found to be bad, as the controller 30 forwards the sheet 10 with the unacceptable image through the reject station. The controller 30 also causes the reject station to print the preselected reject mark on image 16' by activating printer 34' at the appropriate time, i.e. when the portion of sheet 10 is disposed directly below marking device 34'.

Alternatively, station 32 can be provided with a set of printer devices 34 arranged in an array identical to the array of images 16 shown in Figure 3. In this instance when sheet 10 is aligned with the printer arrays, the specific printer 34' corresponding to the unacceptable image is activated thereby marking the unacceptable image with a reject mark.

Of course a sheet 10 may have more than one unacceptable images arranged in a row, in a column, or distributed in a random pattern on the sheet. The microprocessor identifies each of the unacceptable images and orders the reject station to mark each of the images on the sheet accordingly.

Preferably the reject station is constructed to apply the reject mark only on the top surface 22 of sheet 10 even if an unacceptable image is found on the bottom surface because the object is to mark and identify bad documents, and it is not important to mark the actual bad image.

Alternatively, the reject station can be provided with two sets of marking devices, one for the top surface and one on the bottom.

After the reject station the sheet 10 is either stacked of delivery or is slit into individual documents and then stacked.

Obviously numerous modifications may be made to this invention without departing from its scope as defined in the appended claims.

## Claims

1. Printed matter checking apparatus comprising:
    a scanning station for receiving sequentially a plurality of sheets, each sheet having several images, each image defining a document, said scanning station generating data descriptive of said images;
    data processing means receiving said data for analyzing said data to determine whether said images meet preselected criteria; and
    a marking station coupled to said data processing means and receiving sequentially sheets from said scanning station, said marking station marking one document defined by at least one image on one of said sheets with a reject mark when said data processing means determines that said one image does not meet said criteria.

2. The apparatus of claim 1 wherein each said sheet has a top surface with top images and a bottom surface with bottom images, each top image being registered with a bottom image to define one document.

3. The apparatus of claim 1 wherein said marking station marks said top image.

4. The apparatus of claim 1 wherein said images are arranged in rows on said sheet, and said marking apparatus includes a plurality of printing heads, one printing head for each of said row.

5. The apparatus of claim 4 wherein each of said printing heads consists of an impact printer.

6. The apparatus of claim 4 wherein each of said printing heads consists of an ink jet printer.

7. A printing apparatus comprising:
    a printing device for printing a plurality of images on a sheet;
    scanning means for receiving said sheet from said printing device for generating data descriptive of said images;
    data processing means for receiving said data and comparing said data to preselected criteria to determine if each of said images is acceptable; and
    marking means for receiving said sheet, and for marking one of said images with a reject mark if said one image is not acceptable.

8.  The apparatus of claim 7 wherein said sheet
    has a top and a bottom surface and said
    printing device prints top and bottom images
    on said top and bottom surfaces respectively.

9.  The apparatus of claim 8 wherein said scan-
    ning means includes a top and bottom scanner
    for scanning said top and bottom surfaces re-
    spectively.

10. The apparatus of claim 8 wherein each said
    top is in register which each said bottom im-
    age to define a document, and wherein said
    marking means marks said top image of said
    document when one of said top and bottom
    images of said documents are unacceptable.

11. The apparatus of claim 7 wherein said images
    are arranged in rows on said sheet, and said
    marking means includes a plurality of printing
    heads, one printing head for each of said row.

12. A method of checking images on sheet com-
    prising the steps of:
        scanning said sheets sequentially to gen-
    erate data descriptive of said images, each
    image corresponding to a document;
        comparing data for each image to
    preselected criteria to determine if the images
    are unacceptable; and
        marking one document with an image
    found unacceptable with a reject mark.

13. The method of claim 12 wherein each docu-
    ment is defined by a top and bottom image
    disposed on a top and bottom surface of said
    sheet, and wherein said top image of a docu-
    ment is marked with said reject mark if one of
    said top and bottom images of said document
    is unacceptable.

14. The method of claim 12 wherein said sheet
    has a top and bottom surface with top and
    bottom images, said top and bottom images
    being scanned during said scanning step.

REJECT
DEVICE

32

34'

34

FIG. 2

32

REJECT STATION

2

2

26

18

SCANNER

μP
30

28

SCANNER

20

FIG. 1

SCAN
STATION

22

22

24

12

10

14

16

16'

10

22

FIG. 3